Amendments to Claims

Claims 1-31 are pending in the application. The Examiner has allowed claims 1-28, and has rejected claims 29-31 under 35 U.S.C. § 112. Please amend independent claim 29, as follows:

1. (Original) A process for optimizing the excitation waveform that is delivered to an ultrasonic transmitter that, together with an ultrasonic receiver, form part of a nonlinear ultrasonic transmission and reception system comprising:

delivering a transmission test signal to the ultrasonic transmitter;

generating a received test signal from the ultrasonic receiver that is a nonlinear function of the transmission test signal;

developing a nonlinear model of the nonlinear function from the transmission test signal and the received test signal; and

determining an optimum excitation signal for the ultrasonic transmitter that substantially maximizes the signal generated by the ultrasonic receiver based on the model and based on a specified constraint on the excitation signal.

- 2. (Original) The process of Claim 1 wherein developing the nonlinear model includes determining kernel functions of the nonlinear function.
- 3. (Original) The process of Claim 2 wherein an algorithm is used in determining the kernel functions.
- 4. (Original) The process of Claim 2 wherein developing the nonlinear model includes determining principal dynamic modes of the nonlinear function based on the kernel functions.
- 5. (Original) The process of Claim 4 wherein determining an optimum excitation signal includes calculating the time inversion of one or more of the principal dynamic modes.

- 6. (Original) The process of Claim 5 wherein one or more of the kernel functions are excluded when calculating the time inversion.
- 7. (Original) The process of Claim 1 wherein developing the nonlinear model includes determining principal dynamic modes of the nonlinear function.
- 8. (Original) The process of Claim 1 wherein a Laguerre-Volterra network is used in developing the nonlinear model.
- 9. (Original) The process of Claim 8 wherein parameters of the Laguerre-Volterra network are adjusted to minimize the mean-squared error between the signal predicted by the network and the received test signal.
- 10. (Original) The process of Claim 9 wherein the adjustment is an iterative process.
- 11. (Original) The process of Claim 1 wherein the nonlinear model includes a linear filter followed by a static nonlinearity.
- 12. (Original) The process of Claim 1 wherein the specified constraint on the excitation signal includes a constraint on the amplitude of the excitation signal.
- 13. (Original) The process of Claim 1 wherein the specified constraint on the excitation signal includes a constraint on the power of the excitation signal
- 14. (Original) The process of Claim 1 wherein determining an optimum excitation signal maximizes the amplitude of the signal generated by the ultrasonic receiver.
- 15. (Original) The process of Claim 1 wherein determining an optimum excitation maximizes the power of the signal generated by the ultrasonic receiver.

- 16. (Original) The process of Claim 1 wherein the transmission test signal is a wideband signal.
- 17. (Original) The process of Claim 16 wherein the wideband signal covers the bandwidth over which the transmission and reception system is configured to operate.
- 18. (Original) The process of Claim 16 wherein the wideband signal is white noise.
- 19. (Original) The process of Claim 16 wherein the wideband signal is a chirp.
- 20. (Original) The process of Claim 1 wherein the transmission test signal covers a dynamic range.
- 21. (Original) The process of Claim 20 wherein the dynamic range is the dynamic range over which the transmission and reception system is configured to operate.
- 22. (Original) The process of Claim 1 further comprising exciting the ultrasonic transmitter with the optimum excitation signal.
- 23. (Original) The process of Claim 22 wherein a breast is placed between the ultrasonic transmitter and the ultrasonic receiver while exciting the ultrasonic transmitter with the optimum excitation signal.
- 24. (Original) The process of Claim 23 wherein the signal received by the ultrasonic receiver in response to the optimum excitation signal is analyzed to create an image of the breast.
- 25. (Original) An ultrasonic imaging system for generating an image of tissue comprising:

an ultrasonic transmitter that converts an excitation signal into an ultrasonic signal;

an ultrasonic receiver positioned to receive the ultrasonic signal transmitted by the ultrasonic transmitter and that generates a received signal that is a nonlinear function of the excitation signal;

an excitation signal generator in communication with the ultrasonic transmitter that generates an excitation signal that substantially maximizes the signal generated by the ultrasonic receiver based on a specified constraint on the excitation signal; and

a processing system in communication with the ultrasonic receiver for processing the signal generated by the ultrasonic receiver into an image of tissue disposed between the ultrasonic transmitter and ultrasonic receiver.

- 26. (Original) The system of Claim 25 wherein the signal generated by the excitation signal generator is derived from a nonlinear model of the nonlinear function.
- 27. (Original) The system of Claim 26 wherein the nonlinear model is developed from a comparison of a transmitted test signal transmitted by the ultrasonic transmitter and a received test signal generated by the ultrasonic receiver.
- 28. (Original) A process for optimizing the excitation waveform that is delivered to a transmitter that, together with a receiver, form part of a nonlinear transmission and reception system comprising:

delivering a transmission test signal to the transmitter;

generating a received test signal from the receiver that is a nonlinear function of the transmission test signal;

developing a nonlinear model of the nonlinear function from the transmission test signal and the received test signal; and

determining an optimum excitation signal for the transmitter that substantially maximizes the signal generated by the receiver based on the model and based on a specified constraint on the excitation signal.

29. (Currently Amended) A nonlinear transmission and reception system comprising:

a transmitter that converts an excitation signal into a transmitted signal;

a receiver positioned to receive the transmitted signal and that generates a received signal that is a nonlinear function of the excitation signal; and

an excitation signal generator in communication with the transmitter that generates an excitation signal that substantially maximizes the signal generated by the ultrasonic receiver based on a specified constraint on the excitation signal.

- 30. (Original) The system of Claim 29 wherein the signal generated by the excitation signal generator is derived from a nonlinear model of the nonlinear function.
- 31. (Original) The system of Claim 30 wherein the nonlinear model is developed from a comparison of a transmitted test signal transmitted by the transmitter and a received test signal generated by the receiver.